

**Cornell Extension Bulletin 967**



# **WEEVIL CONTROL**

## **...in Farm-Stored Wheat**



**H. H. SCHWARDT**

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# Weevil Control in Farm-stored Wheat

H. H. Schwardt

**G**RAIN weevils take dollars out of your pocket in more ways than one. They eat some of the grain outright, and pollute the rest with their droppings, cast skins, or dead bodies. They may cause the grain to heat to the point of spoilage. They open the kernels so that lesser grain insects can prosper at your expense. They ruin the germinating power of seed grain. They make it impossible to get a loan on your crop. They force you to spend money on protective or remedial measures against them.

## CONTROL

Fortunately, you can outwit the grain weevil at small expense. A thorough weevil-control campaign includes:

Sanitation of the bin and its surroundings

Spraying the empty bin before storing the new crop

Treatment of the incoming grain with dust or spray protectants

Fumigation if other measures have failed

The use of tightly constructed bins that are easily cleaned and fumigated

Frequent inspection of grain during its entire storage period

## Sanitation

Sanitation is the first line of defense against weevils. Bins in barns where hay and livestock or poultry feed are kept will soon be invaded by

A feed room in a granary serves as a continuous source of insect infestation for the market wheat.

*Photo from Kansas State College*



weevils or grain beetles from these sources. If possible, build a bin apart from the barn or, better, get a steel bin and erect it at some distance from the barn. *Before you use a combine or thresher make sure that it contains no grain from last year. Clean these machines thoroughly so that no old and probably infested grain is mixed with the new crop.* Grain left in a drill at planting time may become a source of infestation by harvest time. The same is true for elevators and any other machines used for planting, harvesting, or handling grain. A handful of grain left in a machine for several months can produce enough weevils to infest your new crop.

Sweep the bin thoroughly and spray it before you put in the new crop. Grain that has been stored for a year is almost sure to carry some infestation and to leave even a little of it in a bin under the new crop is poor management.

### **Spray the bin**

Spraying the walls, ceiling, and floor of the bin about two weeks before you store the new crop kills insects that were hiding in cracks during the clean up. It also stops many of those that try to enter the bin after you put the wheat in. Use 2 pounds of 50 percent DDT wettable powder in 5 gallons of water to make the spray, and apply 1 gallon of spray to each 500 square feet of bin surface. This is just enough to wet the sur-

faces evenly. Don't use so much that puddles form on the floor. If DDT is not available, you may use methoxychlor or DDD at the same dosage as for DDT. A 0.5 percent pyrethrum spray also is effective but more expensive than DDT, DDD, or methoxychlor.

Some steel bins have slotted or perforated floors to assist in rapid aeration and drying of the grain. If you plan to fumigate such bins, lay a layer of heavy building paper over the floor before you store the grain. Otherwise the heavy vapor of the fumigant will rapidly drain from the bin through the perforated bottom.

### **Dust or spray incoming grain**

The new wheat-protectant dusts are good insurance against weevil infestation during the months between harvest and winter. These dusts contain pyrethrum and piperonyl butoxide, both of which are harmless to the grain, and the diluent used in them is wheat dust. They remain effective in the grain for weeks or months and kill most of the insects that try to enter the bin.

Apply them at the rate of 75 pounds in each 1000 bushels of grain. Application may be made to the grain stream as it enters the bin or as it leaves the combine. If you shovel the grain into the bin, apply the dust in layers. First dust the floor of the empty bin, then dust the proper amount of material on the grain after

each foot of depth is added. When the bin is full, give the surface of the grain a double application because most infestations start at the surface.

The grain protectants are available also in spray form, and many growers consider the sprays easier to use. The sprays come in emulsifiable concentrate form and are diluted with water for use. The solvent in the concentrates is a vegetable oil so that no mineral-oil odor will be imparted to the grain. Application can be made with simple hand sprayers since the amounts added are small. There is no danger of raising grain moisture significantly by use of protectant sprays. The maximum amount of moisture added is about 0.15 percent, and most of this is lost by evaporation before it can be absorbed by the grain. Dilute the concentrate according to manufacturer's directions on the label, and spray on the grain stream as it enters the bin.

### **Fumigate**

If you do not apply a protectant dust or spray, fumigate the grain sometime during the last two weeks of August.

It is important that the fumigation be done in late August and not earlier or later. If you fumigate the grain immediately after storage in July, there may be time for serious reinfestation between then and the advent of cold weather. If fumigation is delayed

until late September or October, the grain may be infested and significantly damaged before fumigation. Fumigation has the one disadvantage that it does not prevent reinfestation of the wheat. Fumigation of a bin in a barn harboring a large number of weevils gives only short-term protection to grain in the bin. Successful fumigation is dependent on several things. The bin must be reasonably gas-tight, since the gas will diffuse out of the grain too rapidly if there are open cracks in walls or floor. The grain temperature must be 65°F or higher. At lower temperatures the insects are largely inactive and therefore difficult to kill. Fumigation will be more effective in calm than in windy weather. Wind causes the fumigant to diffuse out of the grain rapidly, even if the bin is tightly constructed. Use a good fumigant, such as the ethylene dichloride-carbon tetrachloride mixture, or the same mixture modified by the addition of 5 percent of ethylene dibromide. These fumigants are commercially available. In large-scale investigations in the West, it has been found that fumigation in August is the most effective single measure against grain weevils.

### **To Fumigate**

Make sure that the temperature of the grain is above 65°F.

Level the surface of the grain.

Calculate the number of bushels in

the bin. To do this, multiply the width of the bin by the length of the bin by the depth of grain. This gives the cubic feet of grain, and  $1\frac{1}{4}$  cubic feet make a bushel. Divide cubic feet by 1.25, or multiply cubic feet by 0.8, to find the number of bushels.

If the bin is reasonably tight, use 5 gallons of the ethylene dichloride-carbon tetrachloride mixture, or 4 gallons of the same mixture with ethylene dibromide added. If the bin is not completely enclosed, spread a tarpaulin to one side of the bin so that it can be rolled over the grain quickly after you apply the fumigant. You may make the application with a sprinkling can or simply by pouring the liquid evenly to cover the entire surface, but a spray pump is highly recommended. With a hand-spray pump, you can apply the fumigant from the door and suffer much less exposure to the fumigant. Remove the spray nozzle to make a coarse spray. Neither of the fumigants recommended is highly dangerous in the time required to apply them to the average farm bin, but both are poisonous and exposure for more than about thirty seconds should be avoided. For more than one bin, use the spray pump. After you have applied the fumigant, roll the tarpaulin over the grain, or close and seal the door if the bin is enclosed.

If the bin is outdoors, be sure that its ventilators and windows also are

sealed against loss of fumigant. Put a sign on the door indicating that fumigation is in progress. Keep the children and pets away from the bin for at least two days. During fumigation of a bin built into a barn, keep livestock out of the barn for 24 hours following the fumigation. This applies particularly to young stock or bulls penned under or near a bin under fumigation. In a well-ventilated barn there is no hazard to the milking herd during the short periods of stanchioning for milking.

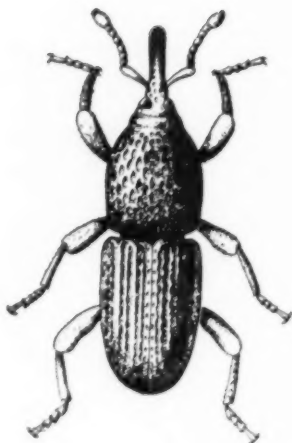
### **Inspect the grain**

Frequent inspection of your grain shows either that it is in good condition or provides enough warning so that you can take corrective measures before there are losses. Inspection for insect infestation is especially important during the weeks just after harvest and until the grain cools below 65°F. If you regularly keep grain in storage on the farm, it will pay you to buy a grain probe, a grain thermometer, and a grain sieve. You can make the sieve by tacking some 12- or 14-mesh house screening on a wood frame, and use a fork handle or an iron rod for a thermometer. The probe, with which to sample the grain at various depths, you will need to buy, or possibly you can borrow one from your County Agricultural Agent.

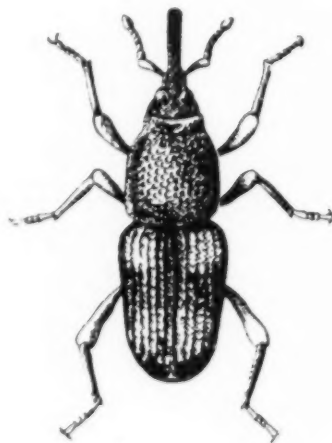
Make an inspection for temperature changes, insect infestation, rodent infestation, and mold. Grain thermom-

eters usually are in a brass case threaded for  $\frac{1}{8}$ -pipe. Attach a 3- or 4- foot length of pipe to the thermometer and push it as deeply as possible into the grain. After half an hour, note the temperature and compare it with air temperature and with the temperature at the surface of the grain. If the temperature down in the grain is 10 degrees or more above that at a depth of 4 to 6 inches, it may indicate insect infestation or a wet pocket in the grain. Make temperature readings at several places in the bin. If you don't have a thermometer, push a fork handle or a metal rod into the grain and leave it for several hours. If on removal the end is noticeably warm to the touch, then the grain is heating. Wherever heating is indicated, take a probe sample and sieve it to find whether weevils are present. If they are, fumigate immediately. This should stop the heating. If no weevils are found, take several probe samples from the hot spot and have a moisture test made at your grain buyers or at a local mill or elevator. If the moisture content is 15 percent or higher, you may have to turn the grain or take some other measures to reduce its moisture content. Odor indicates whether there is mold at the hot spots.

During each inspection take quart samples from the surface at several places in the bin. Shake them in the sieve over a piece of white paper and any insects present will fall through.



**Granary Weevil**  
Enlarged 30 times



**Rice Weevil**  
Enlarged 30 times

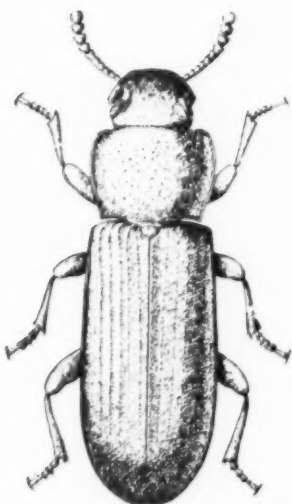
## THE INSECTS

The insects that attack grain are roughly two types called *weevils* and *bran bugs*. Weevils are particularly objectionable, even if they are not present in numbers sufficient to cause heating or much destruction of grain, because they are able to attack and bore into whole, sound grain, leaving cast skins and sometimes dead bodies. These make insect fragments if the grain is milled into flour and therefore reduce its value at the mill. In New York the common weevils are the *granary weevil* and the *rice weevil*.

The bran bugs cannot enter whole grain, but must feed on dust, chaff, broken kernels, or kernels already opened by weevils. Bran bugs common in New York are the *saw-toothed grain beetle*, the *flat grain beetle*, and the *confused flour beetle*. Either type can cause the grain to heat if present in sufficient numbers.



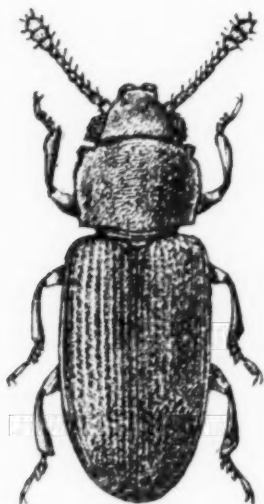
**Saw-Toothed Grain Beetle**  
Enlarged 30 times



**Confused Flour Beetle**  
Enlarged 30 times



**Flat Grain Beetle**  
Enlarged 15 times



Foreign Grain Beetle

Enlarged 30 times



Cooperative Extension Service, New York State College of Agriculture at Cornell University and the U. S. Department of Agriculture cooperating. In furtherance of Acts of Congress May 8, June 30, 1914. M. C. Bond, Director of Extension, Ithaca, New York.